

Membership and Coronal Activity in the NGC 2232 and Cr 140 Open Clusters

Grant NAG5-9131

Annual Performance Report No. 2

For the period 1 March 2001 through 28 February 2002

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This is the second annual performance report for our grant "Membership and Coronal Activity in the NGC 2232 and Cr 140 Open Clusters."

**1. Brief Description of the Primary Objectives and Scope of the Project**

We propose to identify X-ray sources and extract net source counts in 8 archival ROSAT HRI images in the regions of the NGC 2232 and Cr 140 open clusters. These X-ray data will be combined with ground-based photometry and spectroscopy in order to identify G, K, and early-M type cluster members. At present, no members later than ~F5 are currently known for either cluster. With ages of ~25 Myr and at a distance of just 320 – 360 pc, the combined late-type membership of the NGC 2232 and Cr 140 clusters will yield an almost unique sample of solar-type stars in the post-T Tauri/pre-main sequence phase of evolution. These stars will be used to assess the level and dispersion in coronal activity levels, as part of a probe of the importance of magnetic braking and the level of magnetic dynamo activity, for solar-type stars just before they reach the ZAMS.

**2. Progress Report**

Over the past year we have successfully acquired all of the ground-based data necessary to support the analysis of the archival ROSAT X-ray data in the regions around both of these clusters. By the end of 2001 we expect to have completed the reduction and analysis of the ground-based photometry and spectroscopy and will begin the integration of these data with the ROSAT X-ray data. A certain amount of pressure to complete the work on NGC 2232 is coming from the SIRTF project, as this cluster may be a key component to a circumstellar disk evolution GTO program. We are only too happy to try to help and have worked to speed the analysis as much as possible.

**3. Anticipated Activities for the Period 03/01/02 - 02/28/03**

The primary activity to be undertaken in the next few months is the integration of the ground-based photometry and spectroscopy with the archival ROSAT X-ray data and then writing the paper summarizing our results. The most time consuming portion of this next phase is, of course, seeing the paper through publication in a peer-reviewed journal. Therefore, we have requested a no-cost extension to the grant to allow us to bring this project to a conclusion.